[redacted]

The Delphion Integrated View

Title: JP6286186A2: THERMAL HEAD

Country: JP Japan
Kind: A

Inventor: NOGUCHI HIDEO;

Assignee: KYOCERA CORP
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Abstract:

PURPOSE: To provide a thermal head that significantly improve manufacturing yield and production efficiency and has high reliability and small electrical losses.

CONSTITUTION: A pseudo-electrode 33 including a dummy heat resistor 33a, electrode 33b, and electrode 33c is formed on the area except the printing area W of a thermal head 21. The distance x1 between the pseudo-electrode 33 and a common conductor 34 is defined shorter than the distance d20 between the individual electrodes 31 and the common electrode 34 and the distance d21 between the common electrode 42 and the conductor 34. During manufacturing the thermal head 21, when a discharge phenomenon caused by an electric charge accumulated in the heat resistor 32 occurs, an electric current flows from respective resistors 32 to the common conductive 34 via the pseudo-electrode 33.

Family: Show 2 known family members

Other Abstract Info: None

JP 06-286186

CLAIMS

[Claim 1] The common electrode connected common to the one side of the heater element line of which two or more heater elements arrange and consist in the printing area appointed beforehand on a substrate. Two or more individual electrodes connected to the other side of the above-mentioned heater element line, respectively. The drive circuit element connected in order to switch two or more individual electrodes alternatively. it is the thermal head equipped with the above, and connected in common with each element of two or more above-mentioned drive circuit elements -- common, while forming a conductor on a substrate Outside the aforementioned printing area, one side is connected with a common electrode and the false electrode containing the resistor which has bigger resistance than the resistance of the aforementioned heater element is prepared. as common as the false electrode -- the maximum contiguity interval with a conductor is as common as an individual electrode -- as common as the maximum contiguity interval with a conductor, and a common electrode -- it is characterized by being shorter than the maximum contiguity interval with a conductor

DETAILED DESCRIPTION

[0001] [Industrial Application] this invention relates to the thermal head used for facsimile apparatus, a heat transfer printer, etc.

[0002] [Description of the Prior Art] Drawing 7 is the cross section of the typical thermal head 1, and drawing 8 is the plan of a thermal head 1. The glaze layer 3 which consists of glass etc. is formed on the head substrate 2 of the electric insulation to which a thermal head 1 changes from a ceramic etc. The resistor layer 4 of the head substrate 2 which covers the whole surface mostly and consists of tantalum-nitride Ta2N etc. by thin film technologies, such as the sputtering method and a HOTORISO graphic method, is formed on this glaze layer 3. On this resistor layer 4, pattern formation of the aluminum etc. is carried out by the above-mentioned thin film technology, and the common electrode 5 and two or more individual electrodes 6 are formed. The portion of the resistor layer 4 pinched by this common electrode 5 and individual electrode 6 is constituted as two or more exoergic resistors 7 which stand in a row in the shape of a straight line in the longitudinal direction of drawing 8 .

[0003] The aforementioned common electrode 5 is constituted including the array direction of the exoergic resistor 7, the polar zone 8 prolonged in parallel, and the installation section 9 installed along with the periphery of a head substrate from the end of the polar zone 8. moreover, it is prolonged in the same direction as the array direction of the exoergic resistor 7 at the same process as the individual electrode 6 etc. -- common -- from the individual electrode 6 and the aforementioned installation section 9, a conductor 10 vacates intervals d1 and d2, and is formed this -- common -- on a conductor 10, it connects with the individual electrode 6 for every number defined beforehand, and

two or more drive circuit elements 11 which carry out the exoergic drive of the exoergic resistor 7 alternatively are formed along the array direction of the exoergic resistor 7

[0004] alternatively common in any one or the plurality of two or more individual electrodes 6 to which power is supplied to the common electrode 5, and the drive circuit element 11 is connected -- by connecting with a conductor 10, it is energized by the exoergic resistor 7 and a sensible-heat print is performed

[0005] the conventional thermal head 1 -- manufacturing -- hitting -- the common electrode 5 and the individual electrode 6 -- and common -- formation of a conductor 10 is performed as follows As shown in drawing 9 , the glaze layer 3 and the resistor layer 4 are formed on the head substrate 2, in the stage where pattern formation of the resistor layer 4 was carried out, metals, such as aluminum, are formed by sputtering, vacuum evaporationo, etc. on the head substrate 2 at a thin film, pattern formation of the photoresist layer 12 is carried out on this, and a through hole 13 is formed in the field which should form the exoergic resistor 7. then, the aforementioned metal layer patternizes by performing predetermined wet etching etc. -- having -- the common electrode 5 and the individual electrode 6 -- and common -- pattern formation of the conductor 10 is carried out, and the exoergic resistor 7 is constituted

[0006] At this time, by the through hole 13, a metal layer dissolves by etching, and since it is cation-ized, the electron emitted as shown in drawing 9 will be accumulated on the front face of the resistor layer 4. on the other hand, as common as the individual electrode 6 -- between conductors 10 The electrostatic capacity C1 by intervening the photoresist layer 12, as shown in drawing 9 , The electrostatic capacity C2 by intervening the glaze layer 3 and the head substrate 2 exists, as shown in drawing 9 , parallel connection of these electrostatic capacity C1 and C2 is carried out, therefore the joint capacity C0 becomes what applied electrostatic capacity C1 and electrostatic capacity C2.

[0007] as common as the individual electrode 6, when a charge Q0 is accumulated on the resistor layer 4 in a through hole 13 here -- the potential difference V0 occurs between conductors 10, and as common as the individual electrode 6 -- between the distance d1 with a conductor 10 -- electric field E E=V0/d1 -- (1)
It ******. as more common [as the individual electrode 6] to a low case at this time, than the critical electric field E10 in which electric field E become settled uniquely by the material of the photoresist layer 12, the glaze layer 3, and the head substrate 2, as shown in drawing 9 -- while the potential difference V0 had existed between conductors 10, current does not flow to the exoergic resistor 7

[0008] However, when the above-mentioned electric field E exceed the critical electric field E10 which cause dielectric breakdown, dielectric breakdown will arise in the photoresist layer 12, the glaze layer 3, and the head substrate 2, and current will flow to the exoergic resistor 7. electric discharge phenomena, such as such dielectric breakdown, are as common as the electrode 6 according to each -- not generating equally between conductors 10 but generating in respect of a small number on the basis of a portion with a comparatively weak insulating strength is known therefore, as common as individual

electrode 6a shown in drawing 8 -- between conductors 10, when dielectric breakdown arises, as an arrow shows to individual electrode 6a of the part where the charge accumulated at the other individual electrodes 6 produced dielectric breakdown, it will flow intensively, and excessive current will flow to exoergic resistor 7a corresponding to individual electrode 6a

[0009] Exoergic resistor 7a produces the transformation which compounded electric transformation, thermal transformation, and oxidization transformation etc., and it becomes impossible in such a case, to use a thermal head 1 by the excessive Joule's heat by the excessive amount of current.

[0010] then, as common [as shown in drawing 10 , a projected part 15 is formed in the common electrode 5, and] as a projected part 15 -- the distance d2 with a conductor 10 is as common as the individual electrode 6 -- it is made to become smaller than the distance d1 with a conductor 10 common [in the manufacturing process shown by drawing 9] at this time -- between a conductor 10 and a projected part 15, distance d2 is separated and electrostatic capacity C3 is constituted through the above-mentioned photoresist layer 12 and the resistor layer 4, the glaze layer 3, and the head substrate 2

[0011] therefore, as common in connection with the increase in the residual charge Q0 on the exoergic resistor 7 as the individual electrode 6 and a projected part 15 -- the potential difference between conductors 10 increases and first the most common -- an interval with a conductor 10 is short -- common -- the electric field E between a conductor 10 and a projected part 15 reach the critical electric field E10 therefore, an electric discharge phenomenon is common -- it generates first between a conductor 10 and the projected part 15 of the common electrode 5 at this time, the residual charge Q0 on each exoergic resistor 7 is common through the common electrode 5 and a projected part 15, as shown by the arrow of drawing 10 -- it flows into a conductor 10 Therefore, into the portion of each resistor layer 4 which constitutes the exoergic resistor 7, it is only that the current by movement of the charge which remained to the through hole 13 flows, and excessive current does not flow at each exoergic resistor 7. Therefore, generating of electric transformation of the exoergic resistor 7 by the excessive Joule's heat generated by excessive current, thermal transformation, and oxidization transformation can be prevented.

[0012] [Problem(s) to be Solved by the Invention] as mentioned above, as common in the electric discharge phenomenon form a projected part 15 in the common electrode 5 shown by drawing 10 , and according to the residual charge Q0 on the exoergic resistor 7 as a projected part 15 -- it is made to generate between conductors 10 and as common as the electrode 6 according to each -- it has prevented that an electric discharge phenomenon occurs between conductors 10

[0013] however, as common as the salient 15 of the common electrode 5 -- as common by the heat accompanying generating of electric discharge as the salient 15 of the common electrode 5, when electric discharge occurs between conductors 10 -- while the photoresist 16 between conductors 10 carbonizes, the this carbonized photoresist 16

adheres to head substrate 2 front face firmly, and is as common as the salient 15 of the common electrode 5 -- a short circuit occurs between conductors 10 when it prints using such a thermal head, the current which does not contribute to printing is common through the photoresist 16 carbonized from the common electrode 5 -- it flows into a conductor 10 so much, and has the fault from which the power loss of a thermal head serves as size extremely

[0014] While this invention was thought out in view of the above-mentioned fault and the purpose raises the yield and reliability on manufacture sharply, it is in offering the small thermal head of a power loss.

[0015] [Means for Solving the Problem] The common electrode connected common to the one side of the heater element line which arranges this invention in the printing area which two or more heater elements appoint beforehand on a substrate, and changes, In a thermal head equipped with the drive circuit element connected in order to switch alternatively two or more individual electrodes connected to the other side of the above-mentioned heater element line, respectively, and two or more individual electrodes it connected in common with each element of two or more above-mentioned drive circuit elements -- common, while forming a conductor on a substrate Outside the aforementioned printing area, one side is connected with a common electrode and the false electrode containing the resistor which has bigger resistance than the resistance of the aforementioned heater element is prepared. as common as the false electrode -- the maximum contiguity interval with a conductor is as common as an individual electrode -- as common as the maximum contiguity interval with a conductor, and a common electrode -- it is the thermal head characterized by being shorter than the maximum contiguity interval with a conductor

[0016] [Function] the false electrode containing the resistor connected with a common electrode is prepared outside a printing area, and as common as the false electrode, if this invention is followed -- the maximum proximity interval with a conductor is as common as the individual electrode in a printing area -- as common as the maximum proximity interval with a conductor, and a common electrode -- it forms shorter than the maximum proximity interval with a conductor

[0017] therefore, as common as a common electrode and an individual electrode, even if it is the case where a charge is accumulated at each heater element between an individual electrode and a common electrode at the time of manufacture of a thermal head -- the electric discharge phenomenon between conductors is as common as a false electrode with the mutual shortest maximum contiguity interval -- it generates between conductors

[0018] the charge accumulated by this at each heater element is common through a false electrode -- since it flows into a conductor, excessive current is impressed to the heater element of a printing area, and it can prevent effectively that the heater element of a printing area deteriorates

[0019] Moreover, since the false electrode contains the resistor with bigger resistance than the heater element in a printing area, as common as a false electrode -- the photoresist carbonized while the photoresist between conductors carbonized adheres firmly on the surface of a substrate, and is as common as a false electrode, though a short circuit occurs between conductors in case it prints using this thermal head, the current which does not contribute to printing is common through a false electrode from a common electrode -- it can prevent effectively by the resistor contained [that it is going to flow into a conductor, and] in the aforementioned false electrode, and the power loss of a thermal head can be made small

[0020] [Example] Drawing 1 is the part plan of the thermal head 21 of one example of this invention, drawing 2 is the plan of a thermal head 21, and drawing 3 is the cross section seen from cutting plane line A1-A1 of drawing 1 . A thermal head 21 carries two or more drive circuit elements 23 which carry out the exoergic drive of the exoergic resistor train 22 as a heater element line, and is equipped with the head substrate 24 formed from ceramics, such as aluminum-oxide aluminum 2O3, and the external wiring substrate 25 by which circuit wiring was formed in the base material which is connected to the head substrate 24 and consists of a flexible synthetic-resin material or glass epoxy resin material.

[0021] On the head substrate 24, the glaze layers 26, such as glass, and the thick-film electrode layer 27 which screen-stencils a silver paste and changes are formed. Besides, the resistor layer 28 is formed in several 100A thickness by thin film technologies, such as cathode sputtering, in Ta2N etc. Furthermore, on it, along with the periphery of the head substrate 24, pattern formation of the metallic-conductor layers, such as sputtering and aluminum by vacuum evaporationo, is carried out like the drawing 2 illustration, and the common electrode 30 is formed. Moreover, two or more band-like individual electrodes 31 are formed, and the exoergic resistor train 22 which consists of two or more exoergic resistors 32 as a heater element is acquired.

[0022] on the resistor layer 28, two or more drive circuit elements 23 prepared every two or more individual electrodes 31 with the same process as the individual electrode 31 and the same material are arranged in parallel with the exoergic resistor train 22, and are connected common to each drive circuit element 23 by the length covering the array range of the drive circuit element 23 of these plurality -- common -- as a conductor 34 is indicated to be the individual electrode 31 by drawing 1 , distance d20 is vacated and it is formed

[0023] Moreover, the external end-connection child 36 who supplies a signal, drive power, etc. for carrying out the exoergic drive of the exoergic resistor 32 corresponding to the drive circuit element 23 individually is formed two or more [at a time] every drive circuit element 23.

[0024] common -- a conductor -- the * end-connection child 35, the external end-connection child 36, the end-connection child 37 for common electrodes formed in the installation section 38 parallel to the individual electrode 31 in the longitudinal direction

both ends of the head substrate 24 of the common electrode 30 are continued and connected to the longitudinal-direction overall length as shown in the external wiring substrate 25 at drawing 2 of the head substrate 24

[0025] Moreover, it is formed in fields other than the printing area W shown by drawing 1 , and electrode 33b and electrode 33c are formed in them at the same process as the common electrode 30 and the individual electrode 31 so that exoergic resistor 33a for dummies which is not used as an element for printing may become about 10 times [of the resistance of the exoergic resistor 32 in a printing area W] resistance at the same process as the exoergic resistor 32. The false electrode 33 is formed of this exoergic resistor 33a, electrode 33b, and electrode 33c. This electrode 33b is not connected to the drive circuit element 23.

[0026] The common electrode 30 and individual electrode 31 neighborhood is covered, and a protective layer 40 is formed by thin film technologies, such as sputtering. Moreover, the protective layer 41 which covers the drive circuit element 23 neighborhood, for example, consists of electric insulation material, such as an epoxy resin, is formed.

[0027] The manufacturing process of a thermal head 21 is explained in drawing 4 (a) which is the part plan of a thermal head 21, the fragmentary sectional view 4 (b) seen from the cutting plane line A4-A4, and the fragmentary sectional view 4 of the false electrode 33 (c). It patternizes, after it is continued and formed in the whole surface, and the glaze layer 26 covers the whole surface similarly and forms the resistor layer 28 by the thin film technology. Next, the resistor layer 28 continues and forms metal layers, such as aluminum, by thin film technologies, such as sputtering, on the head substrate 24 by which pattern formation was carried out on the whole surface.

[0028] In the stage where the metal layer was formed on the resistor layer 28, negatives are exposed and developed to the pattern which forms the photoresist layer 44 on a metal layer, and forms through holes 45a and 45b in the field corresponding to the exoergic resistor 32 and exoergic resistor 33a, and through holes 45a and 45b are formed. Then, the metal layer exposed in through hole 45a and 45b is dissolved and ionized by giving predetermined wet etching. Thus, the false electrode 33 containing the exoergic resistor 32, the common electrode 30, the individual electrode 31 and exoergic resistor 33a, electrode 33b, and electrode 33c is constituted. At this time, the electron emitted on the resistor layer 28 in through hole 45a when the metallic material which constitutes a metal layer was ionized, as the term of the conventional technology also explained is accumulated. for this reason, as common as the common electrode 30 and the individual electrode 31 -- between conductors 34, the electrostatic capacity C1 which was explained by the term which is the above-mentioned conventional technology is constituted through the photoresist layer 44, and electrostatic capacity C2 is constituted through the resistor layer 28, the glaze layer 26, and the head substrate 24 moreover, an electron is accumulated as mentioned above and as common to 45in through hole of false electrode 33 b as Electrodes 33c and 33b -- between conductors 34, through the photoresist layer 44, as shown by drawing 4 (c), electrostatic capacity C11 is constituted, and electrostatic

capacity C12 is constituted through the resistor layer 28, the glaze layer 26, and the head substrate 24 a point which is greatly different here between the fragmentary sectional view of drawing 4 (c) and the fragmentary sectional view of drawing 4 (b) is as common as the individual electrode 31 of drawing 4 (b) -- distance with a conductor 34 is d20 -- as common as electrode 33b of drawing 4 (c), although kicked -- the distance with a conductor 34 is x1 [shorter than d20] Moreover, the resistance of exoergic resistor 33a is made remarkably larger than the resistance of the exoergic resistor 32 by forming the length of exoergic resistor 33a for a long time than the length of the exoergic resistor 32.

[0029] therefore, as the term of the conventional technology explained, the potential difference V0 occurs, and as common among such electrostatic capacity C1 and C2 shown by drawing 4 (b), as the individual electrode 31, when the residual charge of the resistor layer 28 mentioned above is Q0 -- between the distance d20 with a conductor 34 -- electric field E1 E1=V0/d20 -- (2)
It ******.

[0030] moreover, the potential difference V1 occurs similarly and as common among such electrostatic capacity C11 and C12 shown by drawing 4 (c), as electrode 33b, when the residual charge of the resistor layer 28 mentioned above is Q0 -- between the distance x1 with a conductor 34 -- electric field E2 E2= V1/x1 -- (3)
It ******.

[0031] at this time, electric fields E1 and E2 are as more common to a low case as the individual electrode 31 and electrode 33b than the critical electric field E10 which become settled temporarily by the material of the photoresist layer 44, the glaze layer 26, and the head substrate 2 -- while the potential difference V0 and V1 had existed between conductors 34, current is not flowing to the exoergic resistors 32 and 33a

[0032] However, when the above-mentioned electric fields E1 and E2 exceed the critical electric field E10 which cause dielectric breakdown, dielectric breakdown will arise in the photoresist layer 44, the glaze layer 26, and the head substrate 24 which are shown by drawing 4 , and current will flow to the exoergic resistors 32 and 33a.

[0033] therefore, as common in connection with the increase in each exoergic resistor 32 and the residual charge Q0 on 33a as the individual electrode 31, electrode 33b, and the common electrode 30 -- first the most common, when the potential difference between conductors 34 increases -- as common as electrode 33b with a short interval with a conductor 34 -- the electric field E1 between conductors 34 reach the critical electric field E10 therefore, an electric discharge phenomenon is common -- it generates first between a conductor 34 and electrode 33b At this time, the residual charge Q0 on each exoergic resistor 32 flows into the false electrode 33 through the common electrode 30, as shown by the arrow of drawing 1 . Therefore, it is only that the current by the charge which remained in each through hole 45a flows into the portion of the resistor layer 28 which constitutes the exoergic resistor 32.

[0034] moreover, as common as the false electrode 33 -- though current flows between conductors 34 and the short circuit by carbonization of a photoresist occurs as mentioned above, in case it prints using this thermal head, the current which does not contribute to printing is common through the false electrode 33 from the common electrode 30 -- it can prevent effectively by the resistor with the high resistance contained [that it is going to flow into a conductor 34, and] in the false electrode 33, and the power loss of a thermal head can be made small

[0035] Drawing 5 is the part plan of thermal head 21b of other examples of this invention. this example is similar to the example shown by drawing 1 , and gives the same reference mark to a corresponding portion. The point that this example should have been observed made width of face L2 of the exoergic resistor of the false electrode 51 1/2 or less [of other exoergic resistors 32], and has set up very highly the resistance per unit length of exoergic resistor 51a.

[0036] moreover, as common as the false electrode 51 -- though current flows between conductors 34 and the short circuit by carbonization of a photoresist occurs as mentioned above, in case it prints using this thermal head, the current which does not contribute to printing is common through the false electrode 51 from the common electrode 30 -- it can prevent effectively by the resistor with the high resistance contained [that it is going to flow into a conductor 34, and] in the false electrode 51, and the power loss of a thermal head can be made small

[0037] Drawing 6 is the modification of the example shown by drawing 5 . A different point from the example shown by drawing 5 forms exoergic resistor 52a in the configuration where it moved in a zigzag direction, and lengthens the length of exoergic resistor 52a. therefore, common [by the electric discharge phenomenon / from each exoergic resistor 32 / through false electrode 51b] by enlarging the resistance of exoergic resistor 52a -- current value which flows to a conductor 34 can be lessened further, and the effect explained in the example shown by drawing 5 can be attained

[0038] Moreover, although the false electrode is formed in the one side of a printing area W, you may make the current which flows from the exoergic resistor 32 shunt to both false electrodes in the example explained above, when [of a printing area W] a false electrode is both formed in a side and an electric discharge phenomenon occurs. furthermore, common in the false electrode both prepared in the side -- the length of the maximum contiguity interval with a conductor 34 should be differed within limits shorter than distance d20 and d21, respectively, and as common as each false electrode -- it is good also as what is different in the conditions in which the electric discharge phenomenon between conductors 34 occurs

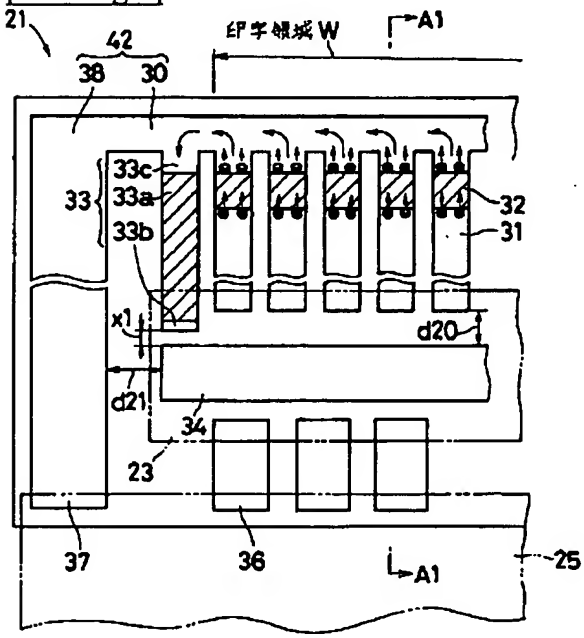
[0039] this invention is not limited to each example mentioned above, by changing the thickness of exoergic resistor 33a, and material, although it explains and excels using the example controlled by changing the resistance of exoergic resistor 33a of the false electrode 33, and area including various modifications, may change resistance and may control it.

[0040] [Effect of the Invention] as common as mentioned above as a false electrode according to this invention -- the maximum contiguity interval with a conductor is as common as the electrode according to each in a printing area -- as common as the maximum contiguity interval with a conductor, and a common electrode -- it is formed shorter than the maximum contiguity interval with a conductor therefore, as common as a common electrode and an individual electrode, even if it is the case where a charge is accumulated at the heater element between an individual electrode and a common electrode at the time of manufacture of a thermal head -- electric discharge phenomena, such as dielectric breakdown between conductors, are as common as a false electrode with the mutual shortest maximum contiguity interval -- it generates between conductors

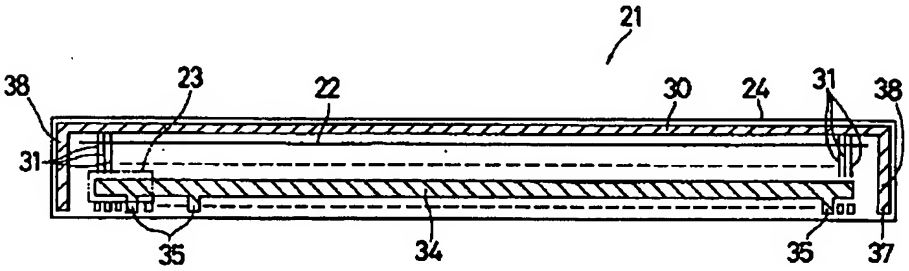
[0041] therefore, the charge accumulated at each exoergic resistor is common through a false electrode -- it can flow into a conductor and a heater element can prevent deteriorating by the Joule's heat by the overcurrent etc. Moreover, since the false electrode contains the resistor with bigger resistance than the heater element in a printing area, as common as a false electrode -- the photoresist between conductors is as common as the false electrode by carbonization, though a short circuit occurs between conductors in case it prints using this thermal head, the current which does not contribute to printing is common through a false electrode from a common electrode -- it can prevent effectively by the resistor contained [that it is going to flow into a conductor, and] in the aforementioned false electrode, and the power loss of a thermal head can be made small Therefore, the yield and productive efficiency on manufacture can be improved, and the small thermal head of a power loss can be obtained highly.

DRAWINGS

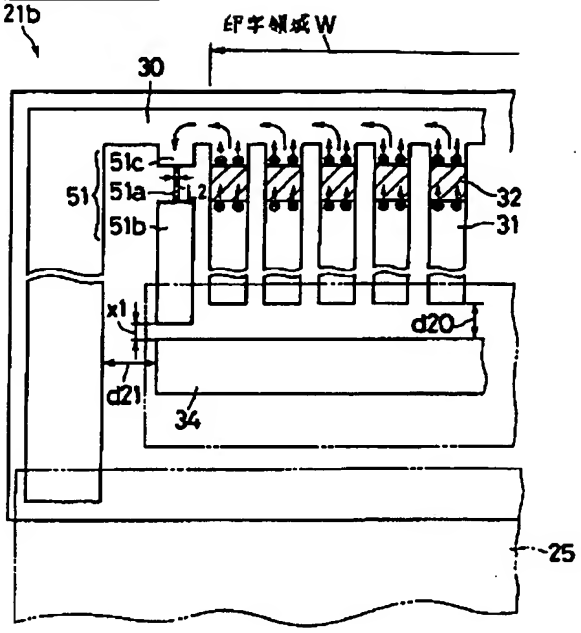
[Drawing 1]



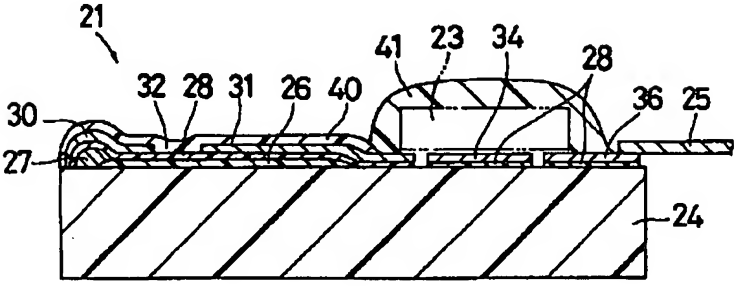
[Drawing 2]



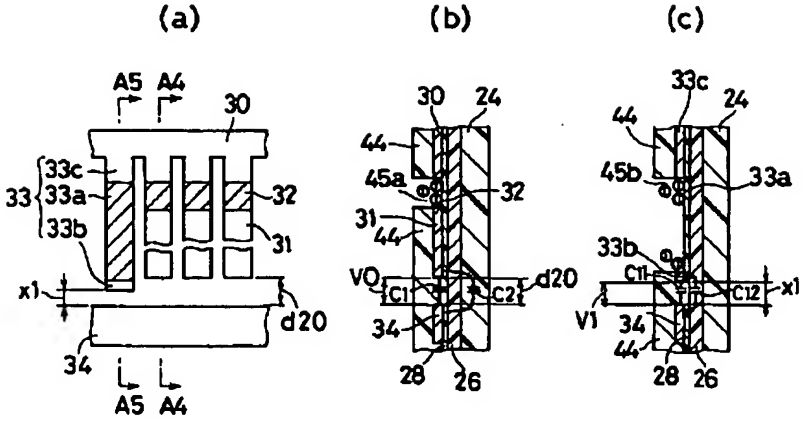
[Drawing 5]



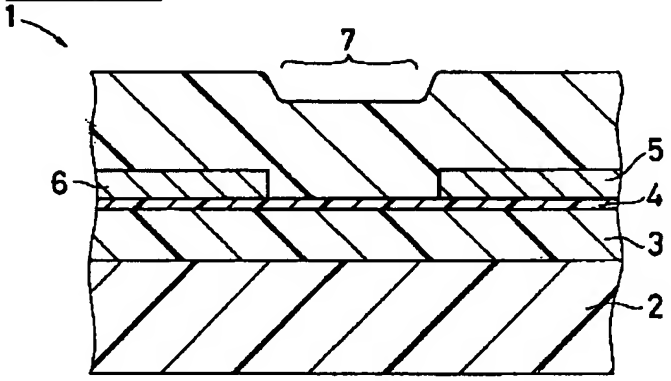
[Drawing 3]



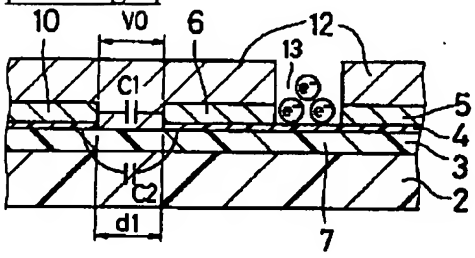
[Drawing 4]



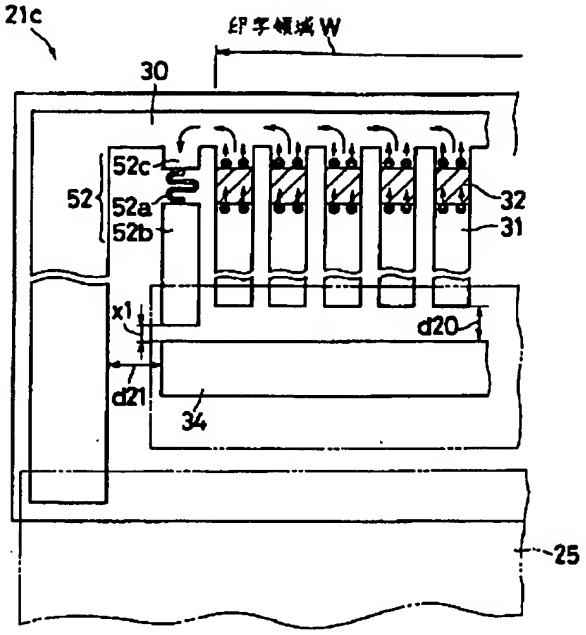
[Drawing 7]



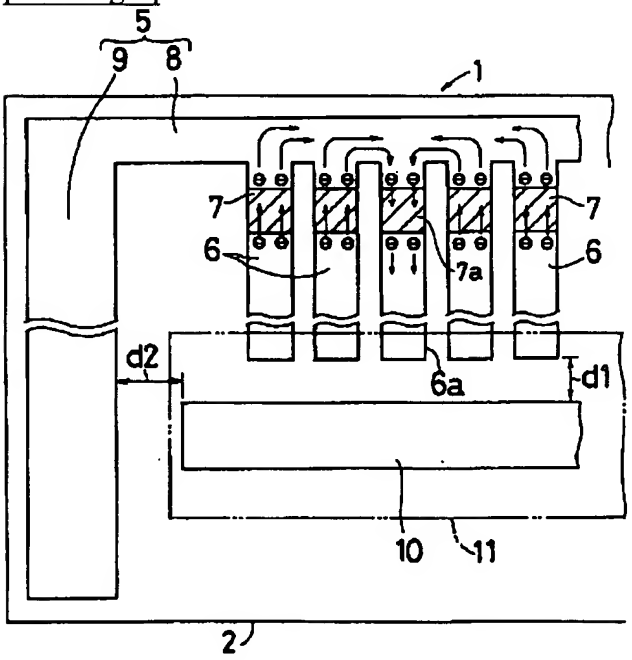
[Drawing 9]



[Drawing 6]



[Drawing 8]



[Drawing 10]